Status of *Marshallia caespitosa* in Louisiana and deletion of var. *signata*

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ABSTRACT

Marshallia caespitosa, represented only by the nominate variety, is conservative and rare in Louisiana, and *M. caespitosa* var. *signata* should be deleted from the Flora of Louisiana. *Published online* ***www.phytologia.org*** *Phytologia 106(1): 1-6 (March 20, 2024). ISSN 030319430.*

KEY WORDS: floristics, coefficients of conservatism, SGCN.

Marshallia caespitosa Nutt. ex. DC. (Asteraceae) is a small perennial forb native to the south-central United States (Watson 2006). It inhabits glades, prairies, and limestone outcrops in Arkansas, Kansas, Louisiana, Missouri, Oklahoma, and Texas (Diggs et al. 1999; Steyermark 1963; Watson 2006; Weakley 2023). Two varieties are often distinguished: var. *signata* Beadle and Boynton with branches midstem into multiple capitula and bears leaves beyond midstem and var. *caespitosa* with singular heads and a scapose appearance with the leaves basally disposed (Diggs et al. 1999; Steyermark 1963; Watson 2006; Weakley 2023) (Fig. 1). An endemic entity from the interior highlands of Arkansas and adjacent states would key to var. *signata* in most works and might confound treatments based on material from that region (Theo Witsell pers. comm., Weakley 2023).

Figure 1. Type specimens of *Marshallia caespitosa* s.s. (left) (DOC, CC-BY-NC) and var. *signata* (right) (PH, CC-BY-NC).

I have had the pleasure to visit multiple populations of this species in Louisiana, and I have taken it upon myself to examine all of the Louisiana records available to me online and a sampling of records from across its range. I have made the following observations:

1. **Var. *signata* is absent-** I examined the Bossier (*Thomas 100127* LSU, Fig. 2) and Caddo ("*Thomas 160*" LSU, Fig. 3) parish specimens cited in the Thomas and Allen (1996) atlas for this variety, which has been tracked in the state at the rank of S1 (critically imperiled) (Natureserve 2023, https://explorer.natureserve.org/). Apparently erroneous is the citation of the Caddo parish specimen as "*Thomas 160*" (Thomas and Allen 1996). The sheet Gandhi annotated and apparently references for his preceding text with Thomas (1989) is numbered "160A", but it was collected by Roselie Overby, one of Dr. Thomas' students, and might represent one of his confusing co-collections (Fig. 3). These specimens align best with var. *caespitosa*, although they bear multiple cauline leaves. Others have collected more typical, basally disposed specimens from these same sites (*DTM 351* LSU, *Reid 5731* LSU). Further, I have visited these stations, which are both Morse Clay prairie remnants, repeatedly since 2020 and I have found only var. *caespitosa*.

   Louisiana material of var. *caespitosa* sometimes has a few cauline leaves below midstem, but the scapes of such plants typically account for more than 50% of the height and they never have multiple heads. Such plants were examined by this genus' monographers, Linda Watson and R.B. Channell (1957), and invariably annotated as var. *caespitosa (R.S. Cocks, 20 April 1916* LSU, *Theiret 25941* DUKE, *Leggett 1381* TENN, *Thomas 88373* USCH). The keys provided in Gandhi and Thomas (1989) and Correll and Johnston (1970) each rely solely on the disposition of the leaves, which probably accounts for the misapplication of the varieties.

   I found no convincing sheets to represent var. *signata* in the dozens of other Louisiana collections. I contend that var. *signata* should be deleted from the flora of Louisiana.

2. **The species is conservative-** "Coefficients of Conservatism" ranging from 6-10 have been assigned for the species as a whole (Reemts and Eidson 2019; Ladd and Thomas 2015; Kelley et al. in prep.). This indicates that the plant is intolerant of anthropogenic habitat disturbance. Indeed, its stations in Louisiana are grassland remnants of moderate to high quality. These include calcareous prairies, sodic barrens (often referred to as saline prairies), coastal prairies, and sodic pine savannas. The soils of these habitats are often alkaline, as is apparently the preference of the species rangewide. It shares these remnants with other rare and conservative plants, for example: *Panicum flexile*, *Cooperia drummondii*, *Symphyotrichum ericoides*, *Houstonia lanceolata*, *Nemastylis geminiflora*, *Polytaenia nuttallii*, *Heliotropium tenellum*, *Sporobolus silveanus*, *Carex meadii*, *Camassia scilloides*, *Helianthemum rosamarinifolium*, amd *Lechea san-sabeana* (pers. obs.).

3. **The species is rare in the state-** Querying iNaturalist (https://www.inaturalist.org/) and SERNEC (http//:sernecportal.org/portal/index.php) for digital records of the species in Louisiana yielded sixty-four apparently unique observations. I have annotated many of these and examined all of their dates, collectors, collection numbers, and localities to eliminate duplicates.

   While I cannot be certain on the number of localities, the records suggest there are less than forty separate populations (pinned locations or label data suggest this many discreet occurrences); at least fifteen (23%) of the record originated from just four sites (the occurrences at these sites separated by less than 1km each). Twenty-nine (45%) of these observations have been made in the past forty years, and 21 (32%) of them have been made in the past twenty. It has been collected from 10 parishes (Fig. 5) and has been observed in all but Jefferson Davis, Rapides, and Sabine

parishes recently. The species typically occurs in small populations, although the largest population I have observed in the state contains 400,000-1,500,000 plants in an area of roughly 120 acres (Fig. 6). Many observations seem to be on unprotected sites such as roadsides. I have witnessed three populations damaged by herbicide in as many years and one of these appears to have been eliminated entirely. While the species is not tracked as rare on the Kisatchie National Forest, biologists there informed me that it is occasionally seen, particularly on the Vernon District (Dave Moore pers.comm.), and that two populations have been seen in the past three years (Christian Cobb pers.comm.).

This species, evidently uncommon on the Louisiana landscape, with most of its populations small, most historical, and many under threat from herbicide application and development, probably deserves a rank of S3 (vulnerable). The species has not recently been ranked by NatureServe; more than 2,700 records exist for the species on iNaturalist and SERNEC. Even allowing for duplicates and historical occurrences, the species appears globally secure, perhaps deserving a rank of G4.

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NORTHEAST LOUISIANA UNIVERSITY
276263
HERBARIUM
HERBARIUM
NORTHEAST LOUISIANA UNIVERSITY, MONROE
Flora of LOUISIANA Parish: BOSSIER
Marshallia caespitosa DC.
Prairie-like area with clay soil north of road at Bodcau Dam northwest side of Bodcau Bayou north of Bellevue; Secs. 21 & 28, T20N, R11W.
Collector: R. Dale Thomas, Trudie Dorris & Lula Day
No. : 100,127 Date: 11 June 1987
University of Louisiana at Monroe
NLU0058677

Figure 2. The Bossier specimen cited as the basis for var. *signata*'s presence in LA (LSU, CC-BY-NC)

NORTHEAST LOUISIANA UNIVERSITY
175105
HERBARIUM
NORTHEAST LOUISIANA UNIVERSITY HERBARIUM
Examined for the Louisiana Flora Project
M. caespitosa var. signata
Beadle & Boynton
Annotated by: K.N. Gandhi
Date: Jan-10.
HERBARIUM OF
NORTHEAST LOUISIANA UNIVERSITY, MONROE
FLORA OF LOUISIANA
Parish: CADDO
Marshallia caespitosa DC.
Property of Dr. C. R. Gowen on east side of Wallace Lake Road, 2.8 miles south of La. 526, Sec. 30, T16N, R13W.
Collector: Rodelie E. Overby
No.: 160A
Date: 28 April 1973
University of Louisiana at Monroe
NLU0058676

Figure 3. The Caddo specimen cited as the basis for var. *signata*'s presence in LA (BRIT: NLU, CC0).

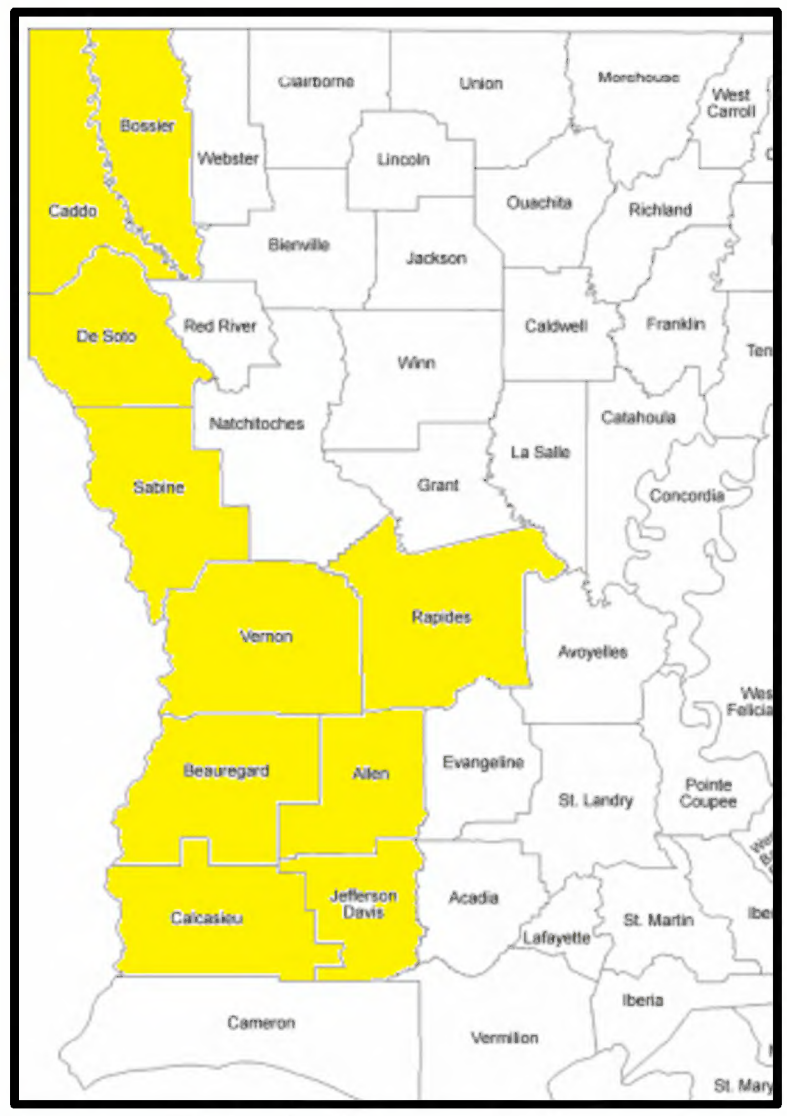

Figure 4. The parish-level distribution of *Marshallia caespitosa* vouchers in LA.

Figure 5. Largest known *Marshallia caespitosa* population in Louisiana, carpeting acres of calcareous prairie, Bossier parish.

Red-orange floral nectar is the most outstanding feature of *Jaltomata amazona* (Solanaceae), a new nightshade from Department Amazonas, Peru

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ABSTRACT

A new *Jaltomata* species (Solanaceae) of the department Amazonas, Peru, is described. The only collections are those of J. J. Wurdack, made in 1962. *J. amazona* is a shrub to 1 m, has a light green, campanulate corolla and grows in the province of Chachapoyas between 2750 and 3250 m. No other congeneric species has the combination of: 1) a dense indument of finger hairs that are not gland-tipped, 2) no more than 2 flowers per inflorescence, 3) a campanulate corolla, 4) lack of a floral corona, and 5) orange-red floral nectar. *Published online* ***www.phytologia.org*** *Phytologia 106(1): 7-12 (March 20, 2024). ISSN 030319430.*

KEY WORDS: Amazonas, colored floral nectar, *Jaltomata,* Peru, Solanaceae.

The Neotropical genus *Jaltomata* includes about 75 species of shrubs and herbs, distributed from Arizona, USA, to Andean South America as far south as Bolivia, and in the Greater Antilles and on the Galápagos Islands (Mione 2023; Mione et al. 2023). All species of *Jaltomata* (Solanaceae) have umbellate inflorescences and leaves that are simple and alternate (often geminate). Flowers are five-merous with five lobes, or 10 if lobules are present. The corolla form is remarkably variable among species and may be rotate, campanulate-rotate, campanulate, crateriform, tubular or urceolate. The ovary has a basal disk, the source of nectar that collects on the base of the corolla (Mione et al. 2020). Anthers dehisce longitudinally and the filament is inserted on the lower ventral face of the anther (basifixed in the three species having a floral corona). The calyx is accrescent but never encloses the berry (Mione 1992).

Phylogenetic studies of *Jaltomata* have revealed two main species groups. Species of the orange fruited clade are nearly all woody, have the full range of corolla forms mentioned above, grow in South America (Mione et al. 1994; Miller et al. 2011; Mione et al. 2016a, b; Wu et al. 2018) and a subset of these have orange-red floral nectar (Leiva 2016a). In contrast, the species of the black-purple fruited clade are herbaceous (suffrutescent at the base) and primarily grow in Mexico and Central America, have rotate corollas, and produce black-purple berries (Mione and Yacher 2005; Mione and Dow 2023). A few species have green fruits, the loss of non-chlorophyl pigments having evolved in parallel in different clades (Miller et al. 2011; Wu et al. 2018; Mione et al. 2020).

Jaltomata species can be found throughout Andean South America to about 4000 m of elevation. Northern Peru has the greatest species richness, with at least 46 species; Leiva et al. (2016b) provides a key to and photos of the species of Department La Libertad, Peru. Despite decades of experience with the

taxonomy of the genus *Jaltomata*, we have been unable to identify two herbarium collections made in 1962 by John J. Wurdack in Department Amazonas. An earlier researcher, Tilton Davis IV, was apparently also unable to identify these specimens and annotated these in 1975 only as "*Jaltomata*." After additional study, we have concluded that the specimens represent a new species and have designated one of the specimens to be the holotype. The holotype has a corolla with "pale green lobes and white sinuses" (Fig. 1) while an additional specimen examined differs by having a "dull blue-purple" corolla (specimen label not shown). We recognize these as a single species because the following character states are present on both: some of the leaves are truncate at the base, there are 1–2 flowers per inflorescence, flowers and fruits are large for the genus, and the indument is a dense covering of eglandular finger hairs (finger hairs are uniseriate and unbranched, Seithe 1979) in a genus where species of the orange fruited clade usually have dendritic hairs. Furthermore, the two specimens were collected within 11 km of each other.

This paper is a contribution to ongoing taxonomic studies of the genus (Mione and Bye 1996; Mione and Coe 1996; Leiva 1998; Leiva and Mione 1999; Mione 1999; Mione and Serazo 1999; Mione et al. 2000; Mione et al. 2001; Mione et al. 2004; Mione and Yacher 2005; Mione et al. 2007; Mione and Spooner 2010; Mione et al. 2011; Mione et al. 2015; Leiva et al. 2016a, b; Mione et al. 2016a, b; Mione et al. 2018; Mione 2023).

Jaltomata amazona Mione sp. nov. TYPE: Peru. Amazonas: Prov. Chachapoyas, lower eastern Calla-Calla slopes, near km 422 of Leimebamaba-Balsas road, 2750–2850 m, 7 July 1962, J. J. Wurdack 1177 (holotype US-2406664!; isotypes K!, NY!). Figs. 1 & 2.

This species differs from other species of *Jaltomata* by possessing the following combination of characters: a dense indument of eglandular finger hairs, no more than 2 flowers per inflorescence, a campanulate corolla that lacks a corona, and orange-red floral nectar.

Shrub to 1 m tall. Young axes villous with only eglandular finger hairs, the hairs to 2 mm long; woody stems terete, glabrous, brown. Leaves alternate or geminate, the blade ovate to lanceolate, likely membranaceous, to 6.5 X 5 cm, densely pubescent on both faces, the apex acute and sometimes acuminate, the base often truncate, the margin entire to slightly repand, ciliate with the finger hairs extending out 1 mm past the margin; petiole to 2 cm. Inflorescence axillary, flowers 1–2 per inflorescence; peduncle 0–10 mm; pedicel to 10 mm; densely villous with only finger hairs. Calyx green, sepals ca. 1 cm long (pedicel to lobe tip), the lobes deltoid, abaxially with a dense covering of finger hairs, the margin ciliate; calyx at fruit maturity to ca. 3 cm across (lobe tip to lobe tip). Corolla campanulate with a broad 10-lobed limb, light-green, the margin densely ciliate with finger hairs to 1 mm long (Fig. 2). Stamens 11 mm long; the filaments glabrous except for the proximal 1 mm, the hairs 0.2 mm; anthers 2.5–2.7 mm long, sagittate. Style 14–15 mm long (missing from the two flowers of the holotype, measured from the paratypes); stigma capitate, 0.81–0.89 mm wide (perpendicular to style), not exserted beyond the corolla (from paratypes only); gynoecium glabrous; nectar red to orange (see Discussion). Berries subspherical, presumably orange, and to 12 mm across at maturity; seeds sub-reniform.

DISCUSSION

Jaltomata amazona produces red to orange floral nectar like the congeneric species described and photographed by Mione (1992), Mione and Anderson (1996), Mione and Leiva (1997), Leiva (1998), Mione (1999), Mione et al. (2015) and Leiva et al. (2016a). The collector, J. J. Wurdack, wrote "Corolla...basally with 3–5 orange glands" on the specimen label (Fig. 1). We have seen similar wording on other specimen labels of congeners that produce red-orange floral nectar. What the collector described as "glands" are, in the 14 living species we have seen, beads of nectar in separate nectar troughs. The nectar is produced by an ovarian nectary (Mione et al. 2020). The nectariferous tissue, an ovarian disk, is not visible without dissecting the flower and thus nectar presentation is secondary (*sensu* Pacini et al. 2003:

15). Mione et al. (2022) present a discussion of two distinct morphologies forming nectar troughs in this genus and discuss the reasons that have been proposed for the evolution of orange-red nectar.

Jaltomata
Determined by Tilton Davis IV 1975
Missouri Botanical Garden
2406664
SMITHSONIAN PERUVIAN EXPEDITION
Departamento de Amazonas, Provincia de Chachapoyas
Saracha
Herb 1 m. Corolla with pale green lobes and white sinuses, basally with 3-5 orange glands.
Lower eastern Calla-Calla slopes, near Km. 422 of Leimebamba-Balsas road, elev. 2750–2850 m.
J. J. WURDACK No. 1177
7 July 1962
Collected in collaboration with the Museo de Historia Natural "Javier Prado", Lima, assisted by a grant from the National Science Foundation.

Figure 1. Holotype of *Jaltomata amazona*, here described. Photo by TM.

Figure 2. Flower on holotype of *Jaltomata amazona*. The stigma-style are missing. Units along bottom are mm. Photo by TM.

The wording "Herb 1 m" appears on the label of the holotype (Fig. 1) but the holotype and the paratype both are woody proximally. All other *Jaltomata* species that produce orange-red floral nectar are woody. Consequently, in the description above we have given that habit as "shrub."

Jaltomata amazona is the only species of this genus having the combination of no more than 2 flowers per inflorescence, a campanulate corolla lacking a corona, orange-red floral nectar, and a dense indument of only eglandular finger hairs. For comparison, the corona (present only in three congeners) may be seen in photos in Plourd and Mione (2016).

Distribution and ecology. *Jaltomata amazona* grows in Peru, Department Amazonas, Province Chachapoyas, between 2750 and 3250 m. Flowering is at least in July (when the specimens were collected) but must also occur in May and June because fruits that appear to be full-size are present on the specimens. We traveled to Peru, Department Amazonas, and attempted to find this species along and near the Leimebamba-Balsas road, including at km 422, in June of 2005 and again in May of 2015. We are generally very successful at finding *Jaltomata* species with the locality information present on herbarium specimen labels. However, in this area we found only a widespread and common species, *J. sinuosa* (Miers) Mione (specimens Mione, Leiva G. and Yacher 708, 849, 851, 852) that we have grown for study (Mione et al. 2017). *Jaltomata sinuosa* differs by having glands at the distal end of all finger hairs, 2–4 flowers per inflorescence, a smaller corolla (to 3 cm across), filaments pubescent along more than half their length, and by lacking colored floral nectar.

Additional specimen examined. PERU. Amazonas: Prov. Chachapoyas, Middle eastern Calla-Calla slopes, 3100–3250 m, near kms 411–416 of Leimebamaba-Balsas road, 11 July 1962, J. J. Wurdack 1311 (NY!, US-2406703!).

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